

*No changes  
to claims*

Clean Version of the Pending Claims

1. (Twice Amended) A method for forming an oxide region on a substrate assembly, the method comprising:

bombarding an exposed region of a volume of semiconductor material composed of a first material with ions of said first material, said volume of semiconductor material composed of said first material being situated on a substrate assembly; and oxidizing said first material in said exposed region.

2. (Twice Amended) A method as recited in Claim 1, wherein ions different from said ions of said first material are bombarded concurrently with said ions of said first material into said exposed region of said volume of semiconductor material.

3. (Once Amended) A method as recited in Claim 2, wherein the implanted ions of said first material comprise silicon ions.

4. (Once Amended) A method as recited in Claim 3, wherein said first material is composed of monocrystalline silicon.

5. (Twice Amended) A method as recited in Claim 1, further comprising:

forming a hard mask on a top surface of the volume of semiconductor material prior to said bombarding an exposed region of a volume of semiconductor material composed of a first material with ions of said first material; and

subsequently forming an opening in the hard mask to expose the region, the ions of said first material being implanted through the opening in the hard mask into the exposed region.

6. (Twice Amended) A method as recited in Claim 5, further comprising forming a spacer around the opening of the hard mask, said spacer extending from the volume of semiconductor material composed of the first material to make contact with the hard mask, wherein said bombarding an exposed region of a volume of semiconductor material composed of a first material with ions of said first material implants said ions of said first material immediately adjacent to but not through the spacer around the opening in the hard mask.

7. (Once Amended) A method as recited in Claim 6, wherein said forming a spacer around the opening of the hard mask further comprises:

depositing a layer of spacer material over the opening in the hard mask; and

etching the layer of spacer material over the opening in the hard mask to form the spacer around the opening in the hard mask.

8. (Once Amended) A method as recited in Claim 7, wherein the layer of spacer material comprises silicon nitride.

9. (Twice Amended) A method as recited in Claim 7, wherein said etching the layer of spacer material is an anisotropic etch, and wherein the spacer is one of a pair of spacers through which the ions of said first material are implanted between but not through the pair of spacers around the opening in the hard mask and into the exposed region, wherein the exposed region is situated between the pair of spacers.

10. (Twice Amended) A method as recited in Claim 9, wherein the pair of spacers are separated by a distance in the range from about 0.05 micrometers to about 0.1 micrometers.

11. (Twice Amended) A method as recited in Claim 1, further comprising the steps, prior to said bombarding an exposed region of a volume of semiconductor material composed of a first material with ions of said first material, of:

forming a pad oxide layer over the volume of semiconductor material composed of the first material;

forming a nitride layer over the pad oxide layer;

forming a photoresist mask over the nitride layer; and

selectively removing the nitride layer through the photoresist mask to expose an opening to the volume of semiconductor material composed of the first material at the region, wherein the first material is oxidized in the region within the opening to the volume of semiconductor material composed of the first material.

12. (Twice Amended) A method as recited in Claim 11, wherein the photoresist mask is removed after said bombarding an exposed region of a volume of semiconductor material composed of a first material with ions of said first material.

13. (Once Amended) A method as recited in Claim 11, wherein said selectively removing the nitride layer through the photoresist mask includes selectively removing the nitride layer and selectively removing the pad oxide layer.

14. (Twice Amended) A method as recited in Claim 1, wherein the exposed region of a volume of semiconductor material has a top surface, and the ions of said first material are implanted into the exposed region in a direction that is within ten degrees from a direction that is orthogonal to the top surface.

15. (Twice Amended) A method as recited in Claim 1, wherein said oxidizing said first material in said exposed region further comprises heating the substrate assembly while exposing the substrate assembly to oxygen.

16. (Twice Amended) A method as recited in Claim 1, wherein the volume of semiconductor material composed of said first material comprises a monocrystalline material having a lattice structure, wherein the implanted ions of said first material in the monocrystalline material cause the lattice structure of the monocrystalline material to become partially randomized at the region into which the ions of said first material are implanted.

17. (Once Amended) A method as recited in Claim 16, wherein both the monocrystalline material and the ions of said first material comprise silicon.

18. (Twice Amended) A method as recited in Claim 1, wherein said oxidizing said first material in said exposed region is conducted at a pressure in the range of about 1 to 25 atmospheres.

19. (Twice Amended) A method as recited in Claim 1, wherein oxidizing said first material in said exposed region is conducted at a pressure in the range of about 5 to 25 atmospheres.

20. (Twice Amended) A method for forming an oxide region on a substrate assembly, the method comprising the steps of:

forming a hard mask over a volume of silicon of a substrate assembly;

forming an opening in the hard mask to expose a region of the volume of silicon;

bombarding the exposed region of the volume of silicon with silicon ions through the opening in the hard mask so as to leave unaltered the conductivity type of the exposed region of the volume of silicon; and

oxidizing the volume of silicon to form silicon dioxide substantially only at the region by exposure of the exposed region to oxygen.

21. (Twice Amended) A method as recited in Claim 20, further comprising forming a spacer around the opening in the hard mask, said spacer extending from the volume of silicon to contact the hard mask, wherein said bombarding the exposed region of the volume of silicon with silicon ions through the opening in the hard mask implants ions immediately adjacent to but not through the spacer around the opening in the hard mask.

22. (Once Amended) A method as recited in Claim 21, wherein said forming a spacer around the opening in the hard mask comprises:

depositing layer of spacer material over the opening in the hard mask; and

anisotropically etching the layer of spacer material at the opening in the hard mask to form the spacer situated around the opening of the hard mask.

23. (Once Amended) A method as recited in Claim 21, wherein the spacer around the opening in the hard mask comprises silicon nitride.

24. (Twice Amended) A method as recited in Claim 21, wherein the spacer is one of a pair of spacers, the ions being implanted in between but not through the pair of spacers and past the hard mask into the exposed region of the volume of silicon, and wherein the exposed region is situated between the pair of spacers, whereby the silicon dioxide is not substantially formed underneath the pair of spacers.

25. (Twice Amended) A method as recited in Claim 24, wherein the pair of spacers are separated by a distance in the range of about 0.05 micrometers to about 0.1 micrometers.

26. (Twice Amended) A method as recited in Claim 20, further comprising forming a pad oxide layer upon the volume of silicon prior to forming a hard mask over a volume of silicon of a substrate assembly, the hard mask being formed upon the pad oxide layer, and said forming a hard mask over a volume of silicon of a substrate assembly comprising:

forming the hard mask upon the pad oxide layer; and

forming a photoresist mask over the hard mask; and wherein silicon dioxide is formed in the volume of silicon at the region beneath the opening in the hard mask.

27. (Twice Amended) A method as recited in Claim 26, wherein the photoresist mask is removed after said bombarding the exposed region of the volume of silicon.

28. (Once Amended) A method as recited in Claim 26, wherein said etching the hard mask also etches through the pad oxide layer.

29. (Twice Amended) A method as recited in Claim 20, wherein the exposed region of a volume of silicon has a top surface, and said bombarding the exposed region of the volume of silicon with silicon ions through the opening in the hard mask is conducted such that the direction that the ions are implanted into the exposed region is within ten degrees from a direction that is orthogonal to the top surface.

30. (Twice Amended) A method as recited in Claim 20, wherein said oxidizing the volume of silicon to form silicon dioxide substantially only at the exposed region by exposure of the exposed region to oxygen further comprises heating the substrate assembly while exposing the substrate assembly to oxygen.

31. (Twice Amended) A method as recited in Claim 20, wherein the volume of silicon comprises monocrystalline silicon having a lattice structure, and wherein the implanted silicon ions in the monocrystalline silicon cause the lattice structure of the monocrystalline silicon to become partially randomized at the exposed region into which the ions are implanted.



32. (Twice Amended) A method for forming an oxide region on a substrate assembly, the method comprising the steps of:

forming a hard mask over a pad oxide layer situated on a volume of silicon of a substrate assembly, the substrate assembly having a top surface;

forming an opening in the hard mask to expose a region of the volume of silicon, said region of said volume of silicon comprises monocrystalline silicon having a lattice structure;

depositing layer of silicon nitride over the opening of the hard mask;

etching the layer of silicon nitride and the pad oxide layer to form a pair of silicon nitride spacers situated on opposite sides of the opening of the hard mask and having said exposed region of the volume of silicon therebetween, each said silicon nitride spacer extending from the volume of silicon to contact the hard mask;

implanting silicon ions between but not through the pair of silicon nitride spacers and through the opening in the hard mask into the exposed region of the volume of silicon such that the direction that the silicon ions are implanted into the exposed region is within ten degrees of a direction that is orthogonal to the top surface of the substrate assembly, wherein the implanted silicon ions do not substantially alter the conductivity type of the region, and wherein the implanted silicon ions in the monocrystalline silicon in the exposed region cause the lattice structure thereof to become partially randomized; and

heating the substrate assembly while exposing the substrate assembly to oxygen so as to form silicon dioxide at the exposed region, whereby the silicon layer oxidizes faster where the silicon ions are implanted than where the silicon ions are not implanted.

33. (Twice Amended) A method as recited in Claim 32, wherein the pair of spacers are separated by a distance in the range of about 0.05 micrometers to about 0.1 micrometers.

45. (Unchanged) A method as recited in Claim 1, wherein said bombarding an exposed region is performed with ions different from said ions of said first material.

46. (Unchanged) A method as recited in Claim 1, further comprising bombarding said exposed region of a volume of semiconductor material composed of a first material with ions different from said ions of said first material.